

MTC 6788
PATENT**Remarks**

Applicants confirm that claims 1, 2, 33, 34, 40-42, 49, 50, 55, 56, 62, 63, 65, 72, 77, 80-83, 88, 93, 96, 99, 100, 124-127, 131-133 and 137-139 are canceled without prejudice to their patentability and presentation in a continuation application.

Claims 113 and 123 are amended to require a weight ratio of the surfactant component to oxalic acid or a salt thereof between about 5:1 and about 40:1.

Rejection under 35 U.S.C. §103(a)

Reconsideration is respectfully requested of the rejection of claims 3-32, 67, 68, 70, 71, 73-76, 78, 79, 84-87, 89-92, 94, 95, 97, 98, 101-123, 128-130, 140-142 and 146-148 under 35 U.S.C. §103(a) over the combined teachings of Hasabe et al. (US 5,863,863), Beestman et al. (US 4,159,901), Wright et al. (US 5,750, 468) and Turner¹.

The Office states that: **Hasabe** teaches liquid enhancer compositions for glyphosate comprising oxalic acid ("OA") and tertiary alkoxyated amine surfactant; and having a weight ratio range of surfactant to oxalate component encompassing the claimed weight ratio range of 5:1 to 40:1; **Beestman** shows the equivalence of the different salts and esters of glyphosate as herbicidal agents, and that they may be combined with alkoxyated alkylamine surfactants and OA derivatives; **Wright** teaches that glyphosate can be combined with etheramine surfactants in liquid or dry concentrates; and **Turner** teaches that surfactants and polybasic acids enhance glyphosate activity, and that glyphosate can be formulated as an aqueous or oil based liquid, or a solid. It is stated that one of ordinary skill in the art would be motivated to combine the glyphosate salts or esters of Beestman with the enhancer composition of Hasabe because Hasabe is not limited to glyphosate acid and because the same adjuvant materials are used in Beestman, albeit for a different purpose. It is further

¹ Turner, D.J. "Effects on glyphosate performance, additives and mixing with other herbicides." *The Herbicide Glyphosate*, Chapter 15, pages 221-239 Grossbard et al., ed., Butterworths (1985).

**MTC 6788
PATENT**

said that the ordinary artisan would be motivated to combine the four references because they disclose the herbicidal enhancing effects of both alkoxyated alkylamine surfactants and OA derivatives in glyphosate compositions.

A. The Cited Art

Applicants respectfully submit that none of the cited references, taken individually or in combination, describe or suggest: aqueous pesticidal concentrate compositions comprising glyphosate, a surfactant component and a compound which increases cell membrane permeability ("enhancer 1"), a compound which increases expression of hydroxyproline-rich glycoproteins ("enhancer 2") or OA, wherein the weight ratio of the surfactant component to the enhancer compound or OA is between about 5:1 and about 40:1 as required by claims 3 (enhancer 1), 101 (enhancer 2), 113 (OA) and 123 (OA); aqueous herbicidal concentrate compositions comprising glyphosate in solution in a concentration in excess of 455 grams a.e./L, and a compound which increases cell membrane permeability, OA or a compound which increases expression of hydroxyproline-rich glycoproteins as required by claims 12, 67 and 109, respectively; an aqueous herbicidal composition comprising glyphosate, a surfactant and OA, wherein the composition has higher herbicidal efficacy than comparable compositions having certain amine surfactants as required by claim 84; aqueous herbicidal compositions comprising glyphosate in solution in a concentration in excess of 360 grams a.e./L, OA, and having efficacy greater than a comparable composition comprising EDTA or sodium citrate instead of OA as required by claim 86; aqueous herbicidal compositions comprising glyphosate in solution and OA wherein the composition has a density of at least about 1.210 grams/L as required by claim 89 compositions comprising a salt of glyphosate other than the IPA salt and a compound which increases cell membrane permeability (claims 17 and 26) or OA (claims 70, 75 and 94), as required by claims 17 (glyphosate Markush not including the IPA salt), 26 (potassium glyphosate), 70 (potassium glyphosate), 75 (diammonium glyphosate) and 94 (glyphosate Markush not including the IPA salt); compositions comprising glyphosate and OA wherein the weight ratio of glyphosate a.e. to OA is greater than

MTC 6788
PATENT

21:1 as required by claim 97; compositions comprising glyphosate, OA and a surfactant selected from a Markush group, wherein the weight ratio of the surfactant to OA is between about 5:1 and about 40:1 as required by claims 113 and 123; solid glyphosate compositions comprising a compound which increases cell membrane permeability ("enhancer 1"), a compound which increases expression of hydroxyproline-rich glycoproteins ("enhancer 2") or OA as required by claims 128 (enhancer 1), 140 (enhancer 2) and 146 (OA), or further comprising a surfactant as required by claim 148 (OA); a method of claim 116 of decreasing the surfactant content of compositions required to provide a given degree of growth control, the method comprising adding OA to compositions comprising glyphosate and a surfactant; or a method of claim 118 of decreasing the aquatic toxicity of aqueous herbicidal compositions without decreasing growth control, the method comprising adding OA to compositions comprising glyphosate.

1. Hasabe

Hasabe describes formulating storage stable compositions containing: the IPA salt of glyphosate; an enhancer which may be a quaternary amine, ethoxylated quaternary amine or ethoxylated tertiary amine surfactant (compositions 1-6 and 13-18), a tallowamine (15EO) surfactant (compositions 7-12), or an ethoxylated quaternary amine in combination with a nonionic ethoxylated lauryl ether amine surfactant (composition 19); and OA or a salt thereof. As reported in example 1 (Tables 1 and 2) OA or a salt thereof is added to the surfactant to achieve temperature stability. Example 1 evaluated surfactant stability in the absence of glyphosate and at a fixed weight ratio of surfactant to oxalate (acid equivalent basis) of 3.9:1 (molar ratio of 1:3). Glyphosate salts are generally described at col. 5, line 24, but particular salts are not described or suggested, while the working examples are directed only to the IPA salt. Table 5 describes concentrates containing 30.4 wt.% a.e. (360 g a.e./l) IPA glyphosate and the Table 1 enhancer compositions wherein the weight ratio of glyphosate a.e. to oxalate is fixed at about 15.6:1 and the weight ratio of surfactant to oxalate is fixed at 3.9:1.

MTC 6788
PATENT

Hasabe provides a general disclosure of a surfactant to OA molar ratio between 10:1 and 1:10 for optimization of surfactant stability (col. 2, lines 8-33). Based on tallowamine ethoxylate (15EO), a weight ratio between about 1:1 and about 100:1 results. Hasabe does not describe or suggest a preferred range for efficacy enhancement, as is instantly claimed. Herbicidal efficacy is described in working examples 2 and 4, but at a fixed surfactant to oxalate a.e. ratio of about 3.9:1; efficacy enhancement at any other ratio is not described or suggested.

The surfactant to enhancer ratio of claims 3 and 101 would not have been obvious in view of Hasabe. Hasabe describes a surfactant to oxalate a.e. weight ratio between about 1:1 and about 100:1 to achieve surfactant stability, but does not suggest a surfactant to enhancer ratio between 5:1 and 40:1 for enhanced efficacy. For efficacy enhancement, Hasabe describes only a single weight ratio of 3.9:1.

The claimed ratio is surprising in view of Hasabe. Applicants have unexpectedly discovered that enhanced glyphosate efficacy remains relatively consistent over the claimed surfactant to enhancer weight ratio range thereby enabling less enhancer and surfactant use while achieving commercial weed control, advantageously resulting in lower application rates, lower cost and reduced environmental burden. In particular:

- (A) Examples 10, 14-16, 18 demonstrate that the lower end of the claimed surfactant to enhancer ratio (7:1 to 9:1) provides similar efficacy as a surfactant to oxalate weight ratio of 1:2 at application rates of 200 g a.e./ha for etheramine surfactant in combination with the potassium ("K"), isopropylamine ("IPA") and ammonium glyphosate salts;
- (B) Example 33 demonstrates that K glyphosate efficacy over a surfactant to OA ratio range of 20:1 to 7:1 for aminated alkoxyated alcohol surfactants remains essentially constant;
- (C) Example 35 evaluated the efficacy of K glyphosate in combination with aminated alkoxyated alcohol surfactants and OA at surfactant to OA ratios between 3.3:1 and 40:1. Commercial weed control for each was established at 300 g a.e./ha. The efficacy at 20:1 was surprisingly found to exceed that at 3.3:1. Example 36 evaluated K glyphosate efficacy with the same surfactant system over surfactant

MTC 6788
PATENT

- to OA ratios between 1:1 and 19:1 with commercial weed control for each at 300 g a.e./ha. Efficacy at a 9:1 ratio was similar to ratios in the range of 1:1 to 4:1;
- (D) Example 41 evaluated K glyphosate efficacy for short EO tallowamine surfactants and OA in surfactant to OA ratios between 10:1 and 25:1. Commercial control was established for each ratio at 300 g a.e./ha with efficacy remaining essentially constant over that ratio range;
- (E) Example 47 evaluated K glyphosate efficacy for the alkylamine surfactant Ethomeen C12 over surfactant to OA ratios between 1:1 and 19:1. Commercial weed control was established for each ratio at 400 g a.e./ha with efficacy for each ratio being essentially equal;
- (F) Example 58 evaluated: IPA glyphosate efficacy for an ethoxylated etheramine surfactant over surfactant to OA ratios of 1:1.3, 3.8:1 and 7.5:1; and ammonium glyphosate efficacy for alkylpolyglycoside surfactant to OA ratios of 1:1.2, 4.3:1 and 8.6:1. In each case the efficacy for 7.5:1 and 8.6:1 ratios was essentially equivalent with the other ratios; and
- (G) Examples 59-64 demonstrate efficacy is generally the same or slightly greater for surfactant to OA in ratios in the preferred 5:1 to 40:1 range as compared to less than 5:1. The data of those examples is directed to K, IPA and Ammonium glyphosate formulated with either no surfactant or with a wide variety of cationic and/or nonionic surfactants.

Even assuming, *arguendo*, that the claimed surfactant to enhancer weight ratio range of 5:1 to 40:1 could be said to be encompassed by Hasabe, it was not known that efficacy remains essentially constant, and may increase, as the surfactant to enhancer ratio increases over the instantly claimed range. Such a result would have been counter-intuitive to those skilled in the art and is not described or suggested by Hasabe, which does not describe or suggest any efficacy effect associated with the claimed range. At most, the claimed ratio range is inherent in Hasabe. But obviousness cannot be predicated on inherency. It is well established that the inherency of an advantage and its obviousness are entirely different questions. That which may be inherent is not

MTC 6788
PATENT

necessarily known, and obviousness cannot be predicated on what is unknown.² The mere fact that a certain thing may result from a given set of circumstances is not sufficient.³ By any reading therefore, Hasabe does suggest the claimed surfactant to enhancer ratio range for enhancing glyphosate efficacy.

2. Beestman

The Office maintains that Beestman shows the equivalence of the different salts and esters of glyphosate as herbicidal agents, teaches that it was known to formulate glyphosate or its salts or esters (columns 11-12) with surfactants (column 3) including dialkoxylated alkylamines such as ethoxylated tallowamine, and teaches that it was known to add OA to glyphosate compositions in order to counteract the activity reducing effect of hard water.

Beestman describes the use of thiol compounds to inhibit glyphosate-induced equipment corrosion. Beestman, in reference to Research Disclosure 15334 ("RD15334"), describes adding OA to glyphosate tank mixes containing hard water (having about 100 to about 2000 ppm Ca⁺⁺ or Mg⁺⁺ ions) at an OA to ion ratio between 1:2 and 2:1, and a weight ratio of glyphosate to OA of between 1:10 and 10:1 in order to counteract the herbicidal inhibiting effect of the hard water (col 7, lines 38-66). RD15334 was submitted to the USPTO in the Information Disclosure Statement of 19 February 2002 as reference number 66. RD15334 at Table 1 describes by working example tank mixes containing OA, about 6 g/l a.i. (about 4.4 g/l a.e.) IPA glyphosate at an IPA glyphosate a.e. to OA weight ratio range of about 5:1 to 1:7, an ethoxylated fatty acid amine (20EO) surfactant, and Ca ions, wherein the molar ratio of oxalate to Ca ions is between 1:1 and 2:1. RD15334 does not disclose surfactant concentration thus

² See *In re Shetty*, 566 F.2d 81, 86, 195 U.S.P.Q. 753, 756-57 (C.C.P.A. 1977)(quoting *In re Spormann*, 363 F.2d 444, 448, 150 U.S.P.Q. 449, 452 (C.C.P.A. 1966)). See also *In re Naylor*, 369 F.2d 765, 768, 152 U.S.P.Q. 106, 108 (C.C.P.A. 1966) ("Inherency] is quite immaterial if . . . one of ordinary skill in the art would not appreciate or recognize that inherent result."); *In re Rijckaert*, 9 F.3d 1531, 1533, 28 U.S.P.Q.2d 1955, 1957 (Fed. Cir. 1993).

³ MPEP §2163.07(a) quoting *In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999).

MTC 6788
PATENT

surfactant to oxalate ratios cannot be calculated, nor is there any suggestion of a ratio such as a weight excess of surfactant over oxalate.

Only Beestman experiment 11 is directed to OA (see col. 4, lines 34-68, col. 6, lines 11-17, Table I, and col. 7, lines 38-41), but herbicidal efficacy was not evaluated. In that experiment glyphosate tank mix corrosion rate was determined for a composition of 41 wt% a.i. (30.4 wt% a.e.) glyphosate containing 15 wt% anionic surfactant and 1 wt% of a dodecanethiol inhibitor which was then diluted 5/95 with water to form a tank mix whereupon OA was added in amount equal to the weight of the IPA glyphosate (i.e., OA:glyphosate a.i. = 1:1; OA:glyphosate a.e. = 1.35:1; and OA:surfactant = 2.7:1). Glyphosate concentrates containing OA or herbicidal efficacy are not suggested by experiment 11.

The purpose of Beestman is to use thio compounds to reduce equipment corrosion caused by glyphosate. Beestman suggests that the many different salts and esters of glyphosate may be expected to exhibit similar corrosion properties. Beestman does not even remotely suggest that those glyphosate forms are equivalent herbicidal agents or that compatible formulations comprising the many possible glyphosate salts and esters, alkoxyated alkylamine surfactants and oxalate can be formed. Contrary to the Office's assertion, Applicants respectfully submit that the citation at columns 10-11 does not suggest that those forms of glyphosate can be formulated with the surfactants at column 3. Column 10, lines 19-24, which immediately preface the cited list of glyphosate compounds, explicitly states that the thio compounds could be expected to provide corrosion inhibition regardless of the source of glyphosate: "[a]lthough the inhibitor efficacy of various thio compounds were exemplified with [IPA glyphosate] in Table I, substantially similar corrosion inhibition can be expected when a thio compound as herein disclosed is admixed with other salts and esters of [glyphosate] such as...." Surfactant and oxalate compatibility is not suggested. Thus one skilled in the art would infer from that disclosure that each of the disclosed forms of glyphosate would be expected to cause corrosion, not that those glyphosate forms are compatible with the column 3 surfactants and oxalate. Any suggestion of surfactant compatibility is absent and not even remotely suggested.

**MTC 6788
PATENT****3. Wright**

Wright describes liquid concentrates containing etheramine surfactant and up to 500 g a.e./L glyphosate. Wright provides no disclosure or suggestion of di- or polycarboxylic acids or any pesticidal composition containing an enhancer compound that (1) increases cell membrane permeability within the plant to increase cellular uptake of the pesticide in the plant or (2) increases expression of hydroxyproline-rich glycoproteins which increases movement of the pesticide to the plant phloem.

Applicants' attorney herewith acknowledges that attorney argument presented in the 24 November 2003 amendment that characterized Wright as not describing solid compositions inadvertently overlooked the passage at column 5, lines 23-65 which teaches that the combination of glyphosate with etheramine surfactants may be in dry form.

4. Turner

Turner discloses that oxalic, citric, tartaric, phosphoric and lactic acids enhance glyphosate activity through their ability to immobilize or sequester polyvalent metal ions. As detailed in the response filed on 24 November 2004 in this application, the entire contents of which are incorporated by reference, Turner describes 2% concentrations of polycarboxylic acids in glyphosate (Roundup®) tank mixes resulting in surfactant to OA weight ratios of about 1:27 and 1:54. Turner thus teaches a large excess by weight of oxalic acid while the pending claims require an excess by weight of surfactant. In fact, Turner's teaching of a S:OA weight ratio of 1:27 results in an oxalic acid concentration (wt% basis) relative to surfactant over 100 times greater than that which results from the claimed ratio of 5:1. Applicants' discovery that glyphosate bioefficacy enhancement, as compared to mere restoration of herbicidal activity through ion chelation as described by Turner, can be achieved when surfactant is present in a weight excess over oxalic acid is surprising and unexpected.

The Office maintains that Turner states that the activity of glyphosate is enhanced by OA, and suggests that it may be due to its chelating ability. Applicants maintain that one skilled in the art would read Turner as only describing the use of OA to restore glyphosate tank mix efficacy lost by the presence of metal ions.

MTC 6788
PATENT

Turner does not teach enhancement of glyphosate activity by OA, but instead describes only restoration of activity otherwise lost by the presence of metal ions. In particular, one skilled in the art would conclude that Turner describes glyphosate enhancement with respect to a metal ion-induced reduced activity baseline, and no disclosure is made of OA induced glyphosate activity enhancement beyond that to be expected in the absence of ions. Turner makes the following disclosures:

- (A) Page 221: "Sequestrants may be included, to help counteract the effects of hard water;"
- (B) Page 229: "Glyphosate can be inactivated by many divalent and trivalent cations." "Antagonistic effects of cations appear to occur within plants and in spray solutions; Nillson (1979) found that glyphosate had less toxicity than expected against wheat grown in solutions containing high amounts of iron or manganese;"
- (C) Page 229: "However...materials which immobilize or sequester polyvalent metals can sometimes remove this antagonism and increase phytotoxicity." In that passage phrase 'increase in phytotoxicity' is in reference to 'antagonism.' When read in context with the entire Turner disclosure, therefore, one skilled in the art would have inferred that sequestrants restore lost activity, but do not increase activity above that to be expected in the absence of metal cations;
- (D) The passage at page 230 cited by the Office which references enhanced glyphosate activity associated with divalent and trivalent acids, similarly as (C) above, would be read by one skilled in the art as measuring enhanced activity as compared to a metal ion-induced reduced efficacy level (i.e., antagonism) because, apparently, in each Turner experiment metal ions were present. In particular, Turner makes no disclosure or suggestion of OA mediated enhanced efficacy as compared to glyphosate in the absence of metal ions, as in for example a tank mix formulated with deionized water; and
- (E) The passage at page 230 immediately following Table 15.4, where it is stated that OA increased the effects of low doses of Roundup (i.e., IPA glyphosate) and glyphosine, is made in reference to field studies where metal ions are inherently present in the water used for glyphosate tank mix preparation. One skilled in the

MTC 6788
PATENT

art would not have interpreted that passage to mean OA induced enhanced efficacy as compared to glyphosate in the absence of metal ions. To the contrary, when read in context with the entire Turner disclosure that passage would have been read to mean restoration of efficacy via metal ion chelation.

Thus, when read in context of the entire Turner publication, one skilled in the art would have concluded that any enhanced activity is in reference to a reduced baseline efficacy resulting from metal ion-induced antagonism. OA-glyphosate synergy was not shown or suggested.

Turner teaches away from the inclusion of the claimed enhancers in glyphosate liquid and solid concentrates. Turner generally discloses at pages 221-222 that glyphosate can be formulated as an aqueous or oil based liquid, or a solid. However, it is further disclosed at page 221 that "...there are limitations as to what can be mixed with a herbicide at the factory. Some chemicals are unstable or react with other ingredients to reduce the storage life of the product...." At page 230, Turner teaches away from the inclusion of enhancers in glyphosate concentrates by disclosing that "[i]n practice these [i.e., acids] additives are difficult to use because they sometimes cause precipitation of glyphosate acid from concentrated spray solutions which can block spray nozzles." Thus Applicant's discovery that di-carboxylic acids can be incorporated in glyphosate concentrates is surprising and unexpected in view of Turner's teaching.

B. References in combination

The cited art taken collectively does not disclose or suggest a combination having the components of claims 3, 12, 17, 26, 67, 70, 75, 84, 86, 89, 94, 97, 101, 109, 113, 116, 118, 123, 128, 140, 146 and 148, nor the claims that depend therefrom.

The Office maintains that it would have been *prima facie* obvious to one of ordinary skill in the art to combine the Hasabe, Beestman, Wright and Turner references. In particular, it was said that one of ordinary skill in the art would be motivated to combine salts and esters as taught in Beestman with the Hasabe enhancing composition because Beestman shows the equivalence of the various salts and esters of glyphosate, Hasabe is not limited to glyphosate acid, and the same adjuvant materials are used in the Beestman and Hasabe formulations. It was further

MTC 6788
PATENT

said that the ordinary artisan would be motivated to combine both the alkylated amine surfactants and oxalic acid in glyphosate compositions because the prior art teaches that those components were known to enhance the herbicidal activity of glyphosate. As to the claimed weight ratio of surfactant to enhancer, the Office maintains that the claimed ratio is encompassed by the prior art and, absent a showing of criticality, is obvious over that art. Finally, the selection of liquid or solid formulations was said to be an obvious variation over the formulations taught by Wright.

The deficiencies of Hasabe are not overcome by Beestman and one of ordinary skill in the art would not have been motivated to combine their teachings to arrive at the instant invention. Hasabe fails to describe or suggest compositions comprising glyphosate, a surfactant and an efficacy enhancer having a surfactant to enhancer weight ratio range between 5:1 and 40:1, glyphosate salts other than the IPA salt, glyphosate concentrates containing greater than 360 g a.e. per liter, glyphosate compositions having a glyphosate to OA weight ratio greater than 21:1, using OA to decrease surfactant loading or aquatic toxicity of glyphosate compositions, and solid compositions. Those deficiencies are not overcome by importing the teaching of Beestman which fails to describe or suggest compatibility of the instantly claimed glyphosate salts and surfactants, any surfactant to OA weight ratio, glyphosate efficacy enhancement beyond restoration of efficacy otherwise lost by the presence of metal ions, or glyphosate liquid or solid concentrates containing OA. In view of Hasabe and Beestman therefore, one of ordinary skill in the art would not have been motivated to combine glyphosate, surfactants and OA to arrive at the instantly claimed invention.

The deficiencies of Hasabe and Beestman are not overcome by Wright and Turner. Wright describes the combination of glyphosate and etheramine surfactants in liquid and solid concentrates, but does not describe or suggest any enhancer such as OA. Turner does not suggest to one of ordinary skill in the art that glyphosate efficacy can be enhanced beyond restoration of efficacy otherwise lost by the presence of metal ions. Moreover, Turner teaches away from the claims by describing a surfactant to OA weight ratio of about 1:27 to 1:54 as required to restore glyphosate activity as compared to the claims which require a weight excess of surfactant over OA to enhance

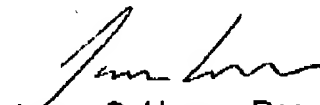
MTC 6788
PATENT

glyphosate activity. Turner further teaches away from the claimed concentrates by describing incompatibility of OA with glyphosate concentrates containing a surfactant.

The disclosures of the cited references taken in combination would not have motivated one skilled in the art to combine their teachings to arrive at the instant claims. Thus, claims 3-32, 67, 68, 70, 71, 73-76, 78, 79, 84-87, 89-92, 94, 95, 97, 98, 101-123, 128-130, 140-142 and 146-148 meet the requirements under 35 U.S.C. §103(a) and are patentable over the cited references taken in combination.

It is believed that no fees are due in connection with this Amendment B. If, however, the Commissioner determines a fee is due, he is hereby authorized to charge said government fees to Deposit Account No. 19-1345.

Respectfully submitted,



James D. Harper, Reg. No. 51,781
SENNIGER, POWERS, LEAVITT & ROEDEL
One Metropolitan Square, 16th Floor
St. Louis, Missouri 63102
(314) 231-5400

JDH/kil